



PATENT  
Attorney Docket 053727-5001-US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application: Kurt R. DAHLBERG <i>et al.</i>	)	
	)	
Application No. 10/000,094	)	Group Art Unit: 3643
	)	
Filed: December 4, 2001	)	Examiner: Son T. Nguyen
	)	
For: POLYSACCHARIDE MUSHROOM	)	
COMPOST SUPPLEMENTS	)	

Commissioner for Patents  
U.S. Patent and Trademark Office  
2011 South Clark Place  
Crystal Plaza Two, Lobby, Room 1B03  
Arlington, VA 22202

Sir:

**DECLARATION UNDER 37 C.F. § 1.132**

I, C. Peter Romaine, Ph.D., declare as follows:

1. I am presently Professor of Plant Pathology at Pennsylvania State University, University Park, Pennsylvania. A copy of my curriculum vitae is attached as Exhibit A.
2. I have read and am familiar with U.S. Patent Application No. 10/000,094 entitled "Polysaccharide Mushroom Compost Supplements" and the various documents available through the U.S. Patent and Trademark Office (U.S. PTO) Patent Application Information Retrieval system that are associated with this application. I understand that this patent application is owned by L. F. Lambert Spawn Co. Inc., Coatesville, Pennsylvania.

3. I have reviewed and understand the claims 1-16 and 18-36 that are presently pending in U.S. Patent Application No. 10/000,094.
4. I have read and understand the Final Office Action that was mailed by the U.S. PTO on October 25, 2004, regarding U.S. Patent Application No. 10/000,094, particularly paragraphs 4-6 on pages 2-7 (*i.e.*, the claim rejections under 35 U.S.C. §§ 102 and 103). It is my understanding that the Patent Examiner maintains that claims 1-16 and 18-36 are anticipated by and/or are obvious over the teachings of Romaine *et al.* (U.S. Patent No. 4,803,800).
5. I am the principal inventor of U.S. Patent No. 4,803,800, "Synthetic Substrate for Filamentous Fungi." This invention comprises a synthetic substrate for the growth of filamentous fungi. The substrate consists of a hydrated hydrogel matrix forming a capsule. The capsule contains nutrients suitable for the growth of fungal mycelium or biocontrol agents. The sterilized hydrogel capsules are colonized with the desired organism. When the hydrogel capsules are inoculated with mushroom fungi, the substrate capsules may be regarded as a synthetic analog of prior known grain substrate for spawn or compost substrate for CACing material. For the reasons set forth in detail below, I do not believe that the teachings of Romaine *et al.* anticipate or render obvious claims 1-16 and 18-36 of U.S. Patent Application No. 10/000,094.
6. Mushroom supplement as disclosed in U.S. Patent Application No. 10/000,094 is a distinctly different material than the synthetic mushroom spawn or CACing material as taught in U.S. Patent No. 4,803,800, as discussed in greater detail below.
7. The polysaccharide components added to the invention described in U.S. Patent No. 4,803,800 function to sustain the growth of fungal mycelium during colonization of the capsules. The polysaccharides also contribute to the irregular external surface texture of the capsules that allows the mycelium to adhere to the capsules. Romaine *et al.* do not claim a stimulatory effect on mushroom yield. In contrast, the polysaccharide

- components disclosed in U.S. Patent Application No. 10/000,094 serve directly as a nutrient for the mushroom crop, thereby increasing mushroom yield.
8. Some of the polysaccharide components added to the invention described in U.S. Patent No. 4,803,800 are substituted cellulose containing ethyl succinylated, methyl, or hydroxyethyl moieties. Such substituted carbohydrates can not be metabolized by the mushroom fungus, and therefore can not function in the nutrient role disclosed in U.S. Patent Application No. 10/000,094.
  9. In the mushroom industry, mushroom spawn typically consists of rye or millet grains that are hydrated, sterilized, and inoculated with mushroom mycelium. After a suitable growth period, the spawn is transported to mushroom farms where it is used to inoculate mushroom growing substrates. Mushroom spawn by definition must be colonized with a mushroom fungus. Mushroom spawn generally has moisture contents in the range of 45 to 50% and must be refrigerated to avoid spoilage. Mushroom spawn typically contains nutrients to support the growth of the mushroom fungus during the spawn growing process. While the mushroom spawn typically delivers some portion of those nutrients to the mushroom growing substrate, the primary purpose of the nutrients is to support the growth of mycelium during the spawn growing process. The primary function of mushroom spawn is to inoculate the mushroom growing substrate, not necessarily to deliver nutrients to the substrate. Mushroom spawn is the fungal equivalent of plant seed. Several non-grain spawn formulations exist, including those taught in U.S. Patent Nos. 5,979,109; 6,029,394; 6,041,544; and 4,803,000. To reiterate, I consider U.S. Patent No. 4,803,800 to teach a non-grain spawn and CACing material, not a mushroom compost supplement that acts to increase mushroom production.
  10. In contrast to spawn, the primary purpose of mushroom compost supplement is to deliver supplementary nutrients to the mushroom growing substrate. The prior art formulas for mushroom compost supplements generally contain high levels of protein components such as soybeans, soybean meal, corn gluten meal, and other materials. The high protein

materials are treated with denaturants or fungicides to prevent mold growth. Mushroom compost supplements are added to the mushroom growing substrate at spawning or at casing. Mushroom compost supplements have moisture contents of less than about 12 to 13% to render them shelf stable during the period between manufacture and use on mushroom farms.

11. U.S. Patent Application No. 10/000,094 describes research that unambiguously shows that the addition of polysaccharides like cellulose to the mushroom growing substrate results in significantly increased mushroom yields. This information was previously unknown in the mushroom industry, and was not anticipated or obvious from any previous research or U.S. Patent No. 4,803,800. Indeed, had this finding been obvious based on U.S. Patent No. 4,803,800, it is likely that I would have developed a polysaccharide mushroom compost supplement!
12. The Office Action dated October 25, 2004 contains several errors and erroneous assumptions. These include:
  - A. The Office Action dated October 25, 2004 repeatedly describes Romaine (U.S. Patent No. 4,803,800) as disclosing “an enriched mushroom compost supplement” or “compost supplement.” These descriptions are in error. U.S. Patent No. 4,803,800 discloses a synthetic substrate that supports the growth and development of filamentous fungi. This is the synthetic analog of a mushroom spawn, not a supplement. U.S. Patent No. 4,803,800 never describes the invention as a mushroom compost supplement.
  - B. Page 2, item 4: “For claim 2, since Romaine et al. employ polysaccharide in the supplement (sic), the added polysaccharide will provides (sic) a significantly higher yield when compared to a supplement lacking the polysaccharide.” U.S. Patent No. 4,803,800 does not attribute any mushroom yield improvements to the presence of polysaccharides in the capsules. Rather, the benefits of the invention are the efficient inoculation of the

mushroom growing substrate and casing layer, not the addition of supplementary nutrients.

C. Page 3: "For claim 5, since Romaine's compost supplement (sic) contains the same ingredient as that of the present invention, the supplement of Romaine should dampens (sic) or suppresses (sic) temperature surges during spawn run just as well as that of the present invention." U.S. Patent No. 4,803,800 describes a capsule containing low levels of polysaccharides and other nutrients. At the low nutrient levels, no compost temperature surges would be expected to occur. Therefore, the low nutrient levels avoid temperature surges rather than suppress them.

D. Page 3: "For claim 6, Romaine et al. do not mentioned (sic) anything about an additional antimicrobial, therefore, Romaine's supplement (sic) does not require the antimicrobial." U.S. Patent No. 4,803,800 describes a material that has been sterilized and inoculated with fungal mycelium. A sterilized material does not require an antimicrobial agent because all foreign microorganisms have been removed by the sterilization process and is protected from further contamination by the presence of high levels of the fungal mycelium.

E. Page 3: "For claim 7, since Romaine's compost supplement (sic) contains the same ingredient as that of the present invention, the supplement of Romaine should suppresses (sic) or reduces (sic) the growth of pest and pathogen microorganisms." The suppression of pests and pathogens is due to the sterilization process, not an inherent reduction in the ability of the capsules to support the growth of other microorganisms.

F. Page 3: "For claim 36, Romaine's cellulose have been treated (col. 5, Table A, the cellulose contains polymers such as ethyl succinylated, methyl, hydroxyethyl, etc. which means that the cellulose was treated with these polymers." Indeed, U.S. Patent No. 4,803,800 describes the use of substituted cellulose polymers in the capsules. Such substitutions render the cellulose nutritionally unsuitable for use by mushroom fungi.

The treatments described in U.S. Patent Application No. 10/000,094 include using phosphoric acid or alkaline peroxide to cause a relaxation of the structure and/or delignification of the cellulose. These treatments increase the nutritional availability of the cellulose and render the cellulose more suitable as a supplementary nutrient.

G. Page 4: "For Claim 8, Romaine et al. teach a plurality of supplements (sic) which one can use (col. 9, lines 31-45), but they are silent about the supplement consisting solely of polysaccharides. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to use solely polysaccharides in the supplement of Romaine et al. depending on the required nutrient/supplement desired for the particular type of mushrooms. Note, Romaine et al. never stated that the supplement consisted of multiple substances mixed together. Romaine et al. merely give a list of supplement (col. 9, lines 31-45) which one could use either solely or mixed together depending on the required nutrient level." Claim 1 of U.S. Patent No. 4,803,800 clearly shows that the invention comprises a mixture of a nutrient capable of sustaining the growth of the filamentous fungus and a hydrated hydrogel matrix. Filamentous fungi require both carbon and nitrogen sources for sustained growth. Nutrients consisting solely of polysaccharides would not support growth of the fungi. Note that all examples in U.S. Patent No. 4,803,800 show the addition of nitrogen containing nutrients such as brewer's grain, alfalfa meal, potato dextrose yeast agar, potato dextrose broth, etc.

H. In the "Response to Arguments" beginning on page 6 of the Office Action dated October 25, 2005, the Examiner misinterpreted the invention disclosed in U.S. Patent No. 4,803,800. To imply that ... "this polysaccharide supplement (sic) doesn't contain mycelia" is incorrect. U.S. Patent No. 4,803,800 col. 9, lines 31-33 states that "The nutrient reserve within the gel matrix must, of course, provide nourishment for the growth and development of the fungus". The whole point of U.S. Patent No. 4,803,800 is the delivery of filamentous fungi to a substrate. The first sentence in the Abstract states that "A synthetic substrate which supports the growth and development of filamentous fungi is disclosed." Claim 1, part b requires that the capsule be inoculated with a

filamentous fungus. The mycelium that must be added to the capsules draw on the nutrient reserves within the capsules in the same way that mycelium on the surface of grain spawn draws on the nutrient reserves within the grain spawn kernel.

13. In summary, for the reasons stated above, I believe that U.S. Patent Application No. 10/000,094 is a novel invention that is neither anticipated nor obvious based on my invention disclosed in U.S. Patent No. 4,803,800.
14. I further declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

By: C. Peter Romaine

Dated: April 20, 2005

**CURRICULUM VITAE**  
**Charles Peter Romaine**

**WORK**

**ADDRESS:**

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**RESIDENCE:**

304 Fairfield Drive  
State College, PA 16801  
Tele: 814-466-7425

**EDUCATION:**

Cornell University, Ithaca, NY

Ph D. degree, Plant Pathology-1977

Dissertation: RNA-dependent RNA Polymerase Activity  
in Non-infected and Tobacco Mosaic Virus-infected  
Tobacco

M.S. degree, Plant Pathology-1974

Thesis: Suggested Viroid Etiology for Chrysanthemum  
Chlorotic Mottle Disease

B.S. degree, Agriculture-1971

**EMPLOYMENT:**

The Pennsylvania State University, University Park, PA

1977-Present: assistant, associate and full professor of  
Plant Pathology

**AFFILIATIONS:**

- American Society for Microbiology
- American Association for the Advancement of Science
- American Phytopathological Society
- American Mushroom Institute
- International Society for Mushroom Science
- International Society for Plant Molecular Biology
- Mycological Society of America



**HONORS****AND AWARDS:**

- Phi Theta Kappa Scholastic Society
- J.A. Adikes Scholarship
- Cornell University, Honors and Distinction

**COURSES****INSTRUCTED:**

- Plant Pathology 405-Concepts of Plant Pathology
- Plant Pathology 408-Plant Pathological Techniques
- Plant Pathology 416-Plant Viruses: Molecules to Populations
- Plant Pathology 422-Plant Virology
- Plant Pathology 444-Biotechnology in Agriculture
- Plant Pathology 496-Independent Studies
- Plant Pathology 590-Seminar
- Plant Pathology 600-Thesis Research
- Plant Pathology 903 -Ornamental Horticulture in Plant Pathology
- Microbiology 415-Comparative Virology

**GRADUATE****THESES****SUPERVISED:**

Eight Ph.D. and thirteen M.S. degrees

**GRADUATE****STUDENT****COMMITTEES:**

Sixty-two Ph.D. and M.S. degree candidates majoring in plant pathology, plant physiology, entomology, horticulture, agricultural engineering, genetics, and molecular and cell biology

**SERVICE:**Department

- 2005-04, Chair-Penn State Annual Mushroom Industry Conference
- 2005-04, Member-Electronic Library Committee
- 2005-02; 1995-92; 1989-83, Member-P & T Committee
- 2005-96, Core Instrumentation Facility Steering Committee
- 2005-87; 82, Session Chair-Mushroom Industry Conference
- 2005-78, Member-Penn State Mushroom Industry Conference
- 2004-03, Chair-Promotion and Tenure (P & T) Committee
- 2003-02; 1998-96; 1994-93, Chair-Research Committee
- 2003-02; 2001-96; 1994-93, Member-Advisory Committee
- 2002, Chair-Environmental Consortium Position Committee
- 2002, Member-Education Committee

- 2001-99, Chair Physical Resources Committee
- 2001, Participant-15<sup>th</sup> North American Mushroom Conference
- 2000, Chair-42<sup>nd</sup> Penn State Mushroom Conference
- 2000-99, Chair-Ad-hoc Farm Committee
- 1999, Chair-Physical Resources Committee
- 1999, Member-Keystone 21 Program (Kellogg Foundation) Group
- 1999, Member-Life Sciences Computational Biology Group
- 1998, Member, Search Committee-Molecular Bacteriologist
- 1997, Member-Search Committee-Systematic Mycologist
- 1996-95, Member-Research Committee
- 1996-94, Member-Graduate Student Recruitment Committee
- 1996-95, Chair-College Strategic Plan for Diversity
- 1994, Chair-College Strategic Planning Committee
- 1992-91, Member-Search Committee-Department Head
- 1991-89, Member-Search Committee-Mushroom Physiologist
- 1990-89, Member-Search Committee-Mushroom Scientist
- 1985-82, Member-Executive Committee
- 1985, Chair-Virology Program-CEESRS Review
- 1985-82, Member-Ben Franklin Partnership Committee
- 1985-78, Member- Student Oral Presentation Committee
- 1984-83, Chair-Graduate Affairs Committee
- 1984-82, Member- Proposed Greenhouse Facility Committee
- 1982, Member-Committee for Teaching Effectiveness
- 1982, Member-Search Committee Chairman, Virologist
- 1982, Member-Mission Statement and Priority Committee
- 1982, Member-John Boyle Retirement Committee
- 1981, Member-Teaching Priorities Committee
- 1981, Member-Search Committee, Department Head
- 1978, Member-Search Committee, Mushroom Geneticist

#### College

- 2005-88, Affiliate-Biotechnology Institute
- 2004-96, Member-Fungal Products Research Group
- 2000-97, Chair-Graduate Faculty Review Committee
- 2000-97, Member-Nominations and Elections Committee
- 2000-92, Organizer/Chair-Scientific Session-PSU Mushroom Industry Conference
- 1995, Chair-College Strategic Plan for Diversity
- 1997, Member-Search Committee-Forestry Molecular Geneticist
- 1995-91, Member-Mushroom Industry Advisory Committee
- 1995, Chair-Penn State Cacao Biotechnology Symposium
- 1985-82, PSU/USDA Mushroom Advisory Committee
- 1985-79, Member-Mushroom Advisory Task Force
- 1984-81, Representative-PSU Genetic Engineering Program
- 1984-77, Executive Board Member-PA Floral Association
- 1981-78, Member-Academic Honesty Hearing Committee

- 1981, Representative-Battelle Genetic Engineering Conference
- 1981-79, Student Registration Official
- 1980, Commencement Marshall-PSU Graduation Ceremony
- 1979, Session Chair-PSU Flower Grower's Short Course
- 1978, Commencement Usher-PSU Graduation Ceremony

#### University

- 2005-78, Member-Graduate Faculty
- 2001-92, Member-Summer Symposium in Molecular Biology
- 1996, Instructor, PCR Workshop, Penn State Biotechnology and Bio-processing Short Course
- 1988, Member-Pollard Graduate Research Award Committee
- 1988, Member-Pfizer Undergraduate Research Award Committee
- 1984-80, Representative- International Development Program
- 1980, Member-University Hearing Board

#### Scientific Community/Industry/Government

- 2005, Chair-Mushroom Genetics and Breeding Session, 5<sup>th</sup> International Conference on Mushroom Biology and Mushroom Products
- 2004, Chair-Scientific Program Committee, XVI<sup>th</sup> ISMS International Congress for the Science and Cultivation of Edible and Medicinal Mushrooms
- 2004, Senior Editor, Science and Cultivation of Edible and Medicinal Mushrooms. Mushroom Science Vol. 16
- 2004, Member, 17<sup>th</sup> North American Mushroom Conference Planning Committee
- 2004-95, Science & Technology Editor-in-chief, *Mushroom News*
- 2004-78, Manuscript Peer Reviewer-*Phytopathology*, *Plant Disease*, *Mycologia*, *Virology*, *Experimental Mycology*, *Journal General Virology*, *Applied & Environmental Microbiology*, others
- 2004-78, Grant Peer Reviewer- NSF, USDA, USAID, and BARD
- 1995-90, Member-Mycovirus Subcommittee-International Committee for the Taxonomy of Viruses
- 1985-82, Associate Editor-*Phytopathology*
- 1984-81, Member-APS Plant Virology Committee
- 1980, Member-Planning Committee-APS Northeast Division

**RESEARCH:** Transgenic breeding of the cultivated mushroom (*Agaricus bisporus*) for crop improvement and biopharmaceutical production; molecular characterization of mushroom viruses; molecular biology/genetics of mushroom pathologies; DNA-based diagnostics for mushroom pathogens; new technologies for mushroom cultivation.

# GRANTS AND CONTRACTS:

Duration	Grant	Amount
2005-04	Development of Alternative Substrates for <i>Agaricus bisporus</i> to Eliminate Environmental Problems Associated with Traditional Composting. D. J. Royse, C. P. Romaine, R. B. Beelman, P. N. Walker, and P. Heinemann. Penn State Mushroom Industry Endowment	\$30,000
2006-05	Inadequate Control of Trichoderma Green Mold on Mushrooms. D. J. Royse and C. P. Romaine. USDA-NE IPM Center-Critical and Emerging Issues	\$23,000
2005-02	A Pesticide Screening Program for the Button Mushroom. D. J. Royse, C. P. Romaine and D. M. Beyer. American Mushroom Institute	\$90,000
2005-01	An Integrated Control Program for Dry Bubble Disease Caused by <i>Verticillium fungicola</i> on the Cultivated Mushroom. D. J. Royse and C. P. Romaine. Mushroom Industry Farmer-based Applied Research Program	\$265,834
2005-01	Transgenic Breeding for the Genetic Improvement of the Cultivated Mushroom, <i>Agaricus bisporus</i> . C. P. Romaine. Penn State Mushroom Industry Endowment	\$140,000
2003-01	An Integrated Control Program for Green Mold Disease on the Cultivated Button Mushroom. C. P. Romaine and D. J. Royse. Pennsylvania Department of Agriculture	\$178,460
2003-00	Evaluation of an SMS-based Potting Medium for Plant Growth and Disease Control. C. P. Romaine and E. J. Holcomb. Mushroom Industry Farmer-based Applied Research Program	\$108,850
2001-00	A Double-stranded RNA Survey for Patch Disease on <i>Agaricus bisporus</i> in the United States. C. P. Romaine and D. J. Royse. Mushroom Industry	\$25,000
2001-99	Phylogeny, Population Genetics, and Fungicide Sensitivity of <i>Verticillium fungicola</i> on the Cultivated Button Mushroom. D. J. Royse and C. P. Romaine. Mushroom Industry Farmer-based Applied Research Program	\$141,813
2001-98	Evaluation of Mushroom Germplasm for Resistance to a Green Mold Population of <i>Trichoderma harzianum</i> (Th4) and Non-target Pathogens for Resistance to Benzimidazole. D. J. Royse and C. P. Romaine. Pennsylvania Department of Agriculture	\$148,201
2000-99	Gene Transfer Technology for the Genetic Improvement of <i>Agaricus bisporus</i> . C. P. Romaine. Sylvan Inc.	\$27,500
2000-99	Toward Defining the Criteria of Quality for Mushroom Compost. C. P. Romaine, P. G. Hatcher, and J. D. H. Van Heemst. Penn State Mushroom Industry Endowment	\$30,000
2000-97	The Nature, Chemistry, and Environmental Impact of Weathering Spent Mushroom Substrate. P. G. Hatcher, C. P. Romaine, J. Chorover, and R. H. Fox. Pennsylvania Mushroom Industry Farmer-based Applied Research Program.	\$542,179
2000-96	Ecological, Nutritional, and Chemical Control of Trichoderma Green Mold of <i>Agaricus bisporus</i> . D. J. Royse and C. P. Romaine. Pennsylvania Mushroom Industry Farmer-based Applied Research Program	\$346,000
2000-96	Rapid PCR-based Diagnostic Test for Bacterial Blight in Geranium. M. A. Sulzinski, C. P. Romaine, and G. A. Moorman. Bedding Plants Foundation Inc.	\$31,000

2000-95	Rapid PCR-based Diagnostic Tests for Pathogens in Geraniums. C. P. Romaine, G. A. Moorman, and M. A. Sulzinski. The Fred C. Gloeckner Foundation	\$56,650
1999-96	Mushroom Green Mold: Cause, Edaphic Factors, and Control. C. P. Romaine, D. J. Royse, P. J. Wuest, and D. M. Beyer. Pennsylvania Department of Agriculture	\$300,265
1998	TRICHODEX: Genotyping and Pathogenicity on Mushrooms. C. P. Romaine. Makteshim-Agan Inc., Israel	\$4,300
1995	Mushroom Solid State Fermentation and Genetic Training Program. D. J. Royse and C. P. Romaine. USDA FAO	\$10,000
1995	DNA Fingerprinting Trichoderma spp. in Mushrooms. C. P. Romaine. Sylvan, Inc.	\$3,400
1995	A Virus-based Expression Vector for the Genetic Improvement of Agaricus bisporus. C. P. Romaine. Campbell's Fresh, Inc.	\$7,000
1995-92	Development and Evaluation of Virus-Indexed Mushrooms. C. P. Romaine. Pennsylvania Department of Agriculture	\$100,576
1995-93	Evaluation of Corn Gluten-based Co-products for the Cultivation of Mushrooms. C. P. Romaine. Cargill Co. Inc.	\$22,800
1994	PCR-based Diagnostic Tests for Pathogens in Geraniums. C. P. Romaine and G. W. Moorman. Ohio Floriculture Foundation	\$4,000
1994-93	Evaluation of the Polymerase Chain Reaction for the Detection of the Bacterial Blight Pathogen of Geranium. M. A. Sulzinski, G. A. Moorman, and C. P. Romaine. Oglevee Associates, Inc.	\$5,500
1992-91	Evaluation of Virus-Indexed Hybrid Mushroom Strains. C. P. Romaine. J. B. Swayne Spawn Co.	\$20,256
1991-90	Isolation of the Structural Polypeptides of the La France Disease-Related 36 nm Spherical Virus. C. P. Romaine. Monterey Mushrooms, Inc.	\$8,000
1991-90	A Synthetic Delivery System for Biocontrol Fungi. C. P. Romaine. ICI America	\$2,400
1991-90	Use of Fibersorb in the Cultivation of Fungi and Plants. C. P. Romaine and R. N. Arteca. ARCO Chemical Co.	\$20,000
1991-89	Exploring a Synthetic Delivery System for the Enhanced Biological Control of Diseases of the Common Mushroom. C. P. Romaine. Pennsylvania Department of Agriculture	\$67,894
1990-1986	Nutrient Capsulation: Exploring Its Potential as a Synthetic Spawn for the Common Mushroom. C. P. Romaine. The Pennsylvania Research Corporation	\$44,748
1987-1986	ELISA for the Detection of cocoa Swollen Shoot Virus. C. P. Romaine. Hershey Foods Co.	\$5,000
1987-1986	Use of Gel Encapsulation in the Cultivation of Agaricus bisporus. C. P. Romaine. Plant Genetics Inc.	\$9,000
1987-1986	An In Vitro Cell Culture System for Cocoa. C. P. Romaine. American Cocoa Research Institute	\$34,345
1986-1982	Improved Techniques for Detecting Mushroom viruses. C. P. Romaine. JB Swayne Spawn Co.	\$40,500
1985-1982	Improved Techniques for Detecting Mushroom Viruses. C. P. Romaine. Blue Prince Mushrooms, England	\$30,824
1984-1982	Application of Cell Culture Methodologies for the Breeding of Cocoa. C. P. Romaine. American Cocoa Research Institute	\$35,000
1982-1980	ELISA for the Detection of Viruses in Ornamental Crops. C. P. Romaine. Gloeckner Foundation	\$11,600
1981-1980	ELISA for the Detection of Viruses in Ornamental Crops. C. P. Romaine. Dillon Foundation	\$5,000

1981-1979	Detection and Characterization of Mushroom Viruses. C. P. Romaine. Heinz Co.	\$54,000
1981-1979	Detection of Mushroom Viruses. C. P. Romaine. Ralston Purina, Inc./Castle and Cooke foods, Inc.	\$2,200
1981-1978	Viruses and Virus Diseases in Geraniums. C. P. Romaine. Phytolab, Inc.	\$5,000
1980-1978	Developing the ELISA Indexing System for Viruses in Ornamental Crops. C. P. Romaine. Dillon Foundation	\$10,000
Grand Total (2005-78)		\$3,045,994

**PRESENTATIONS:** (where multiple authors, presenter's name is underlined)

1. Invited Speaker Romaine, C. P. 2005. "Transgenic breeding of *Agaricus bisporus*: The Next Frontier." 5<sup>th</sup> International Conference on Mushroom Biology and Mushroom Products. Shanghai, P. R. China.
2. Invited Speaker Romaine, C. P. 2005. "Disinfectants in Mushroom Cultivation: Types, Efficacy, and Use Patterns." Sylvan American Inc. Growers Meeting. Kennett Square, PA.
3. Bechara, M. A., P. Heinemann, P. N. Walker, C. P. Romaine, and C. Heuser. 2005. "Cultivation Systems for *Agaricus bisporus* Production." 19<sup>th</sup> Annual College of Agricultural Sciences Graduate Exhibition. The Pennsylvania State University, University Park, PA. (3<sup>rd</sup> place award)
4. Bechara, M. A., P. Heinemann, P. N. Walker, C. P. Romaine, and C. Heuser. 2005. "Cultivation Systems for *Agaricus bisporus* Production." The Pennsylvania State University Annual Graduate Exhibition, University Park, PA. (2<sup>nd</sup> place award)
5. Bechara, M. A., P. Heinemann, P.N. Walker and C. P. Romaine. 2004. Novel Methods for Cultivating *Agaricus bisporus*. 46<sup>th</sup> Annual Mushroom Industry Conference, Penn State University, University Park, PA, USA, June 6-9.
6. Bechara, M. A., P. Heinemann, P. N. Walker, C. P. Romaine, and C. Heuser. 2004. Novel Method for Cultivating *Agaricus bisporus*. ASAE/CSIR Annual International Meeting. Ottawa, CN.
7. Kuang, M., M. M. Goodin, C. Schlagnhauer, B. Schlagnhauer, and C. P. Romaine. "Molecular Genetic Analysis of Double-stranded RNA Viruses in *Agaricus bisporus*." XVI<sup>th</sup> Congress of the International Society for Mushroom Science. Miami, FL.
8. Invited Speaker Romaine, C. P. 2004. "Molecular Pharming in Mushrooms." University of Costa Rica. San Jose, Costa Rica.

9. Invited Speaker Romaine, C. P. 2004. "Mushroom Pharming." Penn State-sponsored University & Industry Consortium. Harrisburg, PA.
10. Romaine, C. P. 2004. "The Growers Corner-Pest and Diseases Panel." 46<sup>th</sup> Penn State Mushroom Industry Conference, University Park, PA.
11. Romaine, C. P., X. Chen, and C. Schlagnhauer. 2004. "Fruiting Body Gene Transfer Method for *Agaricus bisporus* Potentiates Crop Improvement and Pharming." XVI<sup>th</sup> Congress of the International Society for Mushroom Science. Miami, FL.
12. Velcko, A. J., R. W. Kerrigan, L. A. MacDonald, M. P. Wach, C. Schlagnhauer, and C. P. Romaine. 2004. "Expression of Novel Genes in *Agaricus bisporus* Using an *Agrobacterium*-mediated Transformation Technique." XVI<sup>th</sup> Congress of the International Society for Mushroom Science. Miami, FL.
13. Invited speaker-Romaine, C. P. 2003. "Transgenic Breeding of *Agaricus bisporus* for Crop Improvement and Pharming". Harrogate Conference. Harrogate, England.
14. Invited speaker-Romaine, C. P. 2003. "Casting Light on Biotech Mushrooms for Disease and Insect Management". 51<sup>st</sup> Annual Meeting of the Entomological Society of America. Cincinnati, OH.
15. Invited speaker-Romaine, C. P. 2003. "Chemical Disinfectants for the Control of Mushroom Pathogens". VIII<sup>th</sup> National Congress of Mycology. Toluca, Mexico.
16. Invited speaker-Romaine, C. P. 2003. "Genetically Engineering the Mushroom, *Agaricus bisporus*, for Crop Improvement". VIII<sup>th</sup> National Congress of Mycology. Toluca, Mexico.
17. Stone, M. C. Schlagnhauer, L. A. MacDonald M. P. Wach, and C. P. Romaine. 2003. "Optimization of the *Agrobacterium*-mediated Fruiting Body Tissue Method for the Transformation of *Agaricus bisporus*". 22<sup>nd</sup> Asilomar Fungal Genetics Conference. Pacific Grove, CA.
18. Romaine C. P. 2003. "Hands-on Disease Diagnosis". 45<sup>th</sup> Penn State Mushroom Industry Conference, University Park, PA.
19. Romaine, C. P. 2003. "Current Trends in Pest Management: Chemical, Transgenic Resistance, and DNA-based Diagnostics". 45<sup>th</sup> Penn State Mushroom Industry Conference, University Park, PA

20. Collopy, P. D., M. L. Largebeau-Mamoun, C. P. Romaine, and D. J. Royse. 2002. "Molecular Genetic Variation in Populations of *Verticillium fungicola* on the Cultivated Button Mushroom, *Agaricus bisporus*." IV<sup>th</sup> Conference on Mushroom Biology and Mushroom Products. Cuernavaca, Morales, Mexico.
21. Chen, X., M. Stone, C. Schlagnhauer, and C. P. Romaine. 2002. "A Fruit Body Tissue Method for Efficient *Agrobacterium*-mediated Genetic Transformation of *Agaricus bisporus*." 4<sup>th</sup> Latin American Congress of Mycology. Xalapa, Veracruz, Mexico.
22. Chen, X., M. Stone, C. Schlagnhauer, and C. P. Romaine. 2002. "A Fruit Body Tissue Method for Efficient *Agrobacterium*-mediated Genetic Transformation of *Agaricus bisporus*." Dinner and Data Meeting sponsored by The Life Sciences Consortium and The Pennsylvania Biotechnology Association. University Park, PA.
23. Invited speaker-Romaine, C. P. 2002. "DNA-based Detection/Diagnosis and Control Practices for Disease of the Cultivate Button Mushroom." 4<sup>th</sup> Mexican Mushroom Conference. San Miguel de Allende, Mexico.
24. Invited speaker-Romaine, C. P. 2002. "Use of SMS as a Component of a Potting Medium for the Control of Plant Diseases and Growth of Bedding Plants." 4<sup>th</sup> Mexican Mushroom Conference. San Miguel de Allende, Mexico.
25. Romaine, C. P. 2002. "Synopsis of Mushroom Research Program." Research Meeting sponsored by the American Mushroom Institute and held in conjunction with the 44<sup>th</sup> Penn State Mushroom Industry Conference. University Park, PA.
26. Romaine, C. P. 2002. "Agaricus Panel Session." 44<sup>th</sup> Penn State Mushroom Industry Conference. University Park, PA.
27. Invited speaker-Romaine. 2002. August 15. Disinfectants and Other Factors for Controlling Diseases of *Agaricus bisporus*. Kennett Square. PA. Sylvan-sponsored Pennsylvania Mushroom Growers Conference.
28. Romaine, C. P. 2002. Aspects of Controlling Green Mold, Dry Bubble and Virus Diseases. 44<sup>th</sup> Penn State Mushroom Industry Conference.
29. Romaine, C. P., Chen, X., Royse, D. J., and Ospina-Giraldo, M. D. 2002. Molecular Genetic and Biological Characterization of *Trichoderma aggressivum* on the Button mushroom, *Agaricus bisporus*. 1<sup>st</sup> international *Trichoderma*-Tricel Joint Meeting. Cancun, Mexico.



30. Stone, M., C. Schlagnhauser, L. A. MacDonald, M. P. Wach, and C. P. Romaine. 2002. Optimization of the *Agrobacterium*-mediated Fruiting Body Tissue Method for the Genetic Transformation of *Agaricus bisporus*. 4<sup>th</sup> Latin American Congress of Mycology. Xalapa, Mexico.
31. Collopy, P. D., M. L. Largeau-Mamoun, C. P. Romaine, and D. J. Royse. 2001. "Molecular Phylogenetic Analyses of Populations of *Verticillium fungicola* of the Cultivated Button Mushroom." Annual Meeting of the American Phytopathological Society. Salt Lake City Utah.
32. Kuang, M. and C. P. Romaine. 2001. "Genetically Engineering La France Disease Resistance in the Mushroom." 43<sup>rd</sup> Penn State Mushroom Short Course. University Park, PA.
33. Romaine, C. P. 2001 Genetically Engineering the Cultivated Mushroom, *Agaricus bisporus*, for Crop Improvement. 8<sup>th</sup> Mushroom Review-Substrate Spawn, and Supplements. Penn State
34. Romaine, C. P. 2001. "Mushroom Research Program." Sponsored by the American Mushroom Institute and held in conjunction with the 43<sup>rd</sup> Penn State Mushroom Short Course. University Park, PA.
35. Romaine, C. P. 2001. Pesticide Round Table Discussion. American Mushroom Institute, Avondale, PA.
36. Romaine, C. P. and E. J. Holcomb. 2001. "SMS Amendments for Plant Growth and Disease Suppression." 43<sup>rd</sup> Penn State Mushroom Short Course. University Park, PA.
37. Invited speaker-Romaine, C. P. "A Review of Infectious Diseases and Competitor Molds on *Agaricus* Mushrooms?" 3<sup>rd</sup> Mexican Mushroom Conference and FungiExpo 2001. Puerto Vallarta, Mexico.
38. Invited speaker-Romaine, C. P. 2001. "Advances in the Genetic Engineering of the Mushroom." 3<sup>rd</sup> Mexican Mushroom Conference and FungiExpo 2001. (2001) Puerto Vallarta, Mexico.
39. Invited Speaker-Romaine, C. P. 2001. "Bio-control of Turfgrass and Damping-off Disease Using SMS." Monterey Mushrooms Growers Conference. Monterey, CA.
40. Invited Speaker-Romaine, C. P. 2001. "Introduction of New Genetic Material in *Agaricus bisporus*." Monterey Mushrooms Growers Conference. Monterey, CA.

41. Invited speaker-Romaine, C. P., X. Chen, M. Stone, and C. Schlagnhauer. 2001. "A Fruitbody Tissue Method for *Agrobacterium*-mediated Genetic Transformation of the Button Mushroom." 21<sup>th</sup> Fungal Genetics Conference. Asilomar, Pacific Grove, CA.
42. Collopy P. D., C. P. Romaine, and D. J. Royse. 2000. Genetic Variation in Populations of *Verticillium fungicola* on the Cultivated Button Mushroom *Agaricus bisporus*. Annual Meeting of the American Phytopathological Society. New Orleans, LA.
43. Gaze, R. H., L. Calvo-Bado, M. P. Challen, B. Aide, and C. P. Romaine. 2000. A New Virus Disease of *Agaricus bisporus*? XV<sup>th</sup> International Congress on the Science and Cultivation of Edible Fungi. Maastricht, The Netherlands.
44. Mullins, E. D., C. P. Romaine, X. Chen, D. Geiser, R. Raina, and S. Kang. 2000. *Agrobacterium tumefaciens*-mediated Transformation of *Fusarium oxysporum*: A Valuable Tool for Tagging Pathogenicity Genes. Annual Meeting of the American Phytopathological Society. New Orleans, LA.
45. Ospina-Giraldo, M. D., P. D. Collopy, X. Chen, C. P. Romaine, and D. J. Royse. 2000. Identification of Sequences Expressed During Primordia and Basidiome Stages of *Agaricus bisporus*. XV<sup>th</sup> International Congress on the Science and Cultivation of Edible Fungi. Maastricht, The Netherlands.
46. Invited speaker-Romaine, C. P. 2000. "Advances in the Genetic Engineering of *Agaricus bisporus*." 7<sup>th</sup> Mexican Mycological Congress. Queretaro, Mexico.
47. Invited speaker-Romaine, C. P. 2000. "Genetically-engineered *Agaricus bisporus*: Curse or Cornucopia?" Monterey Mushrooms Growers Conference. Monterey, CA.
48. Invited speaker-Romaine, C. P. 2000. "Viral Pathologies and Trichoderma Green Mold on *Agaricus bisporus*." Monterey Mushrooms Growers Conference. Monterey, CA.
49. Romaine, C. P. 2000. Benlate Usage and Green Mold. Mushroom Growers' Meeting. Temple, PA
50. Romaine, C. P. 2000. Emerging Benomyl Resistance in the Th4 Population. Educational Session 2000 for Mushroom Producers. Stroud Water Research Center. Avondale, PA

51. Romaine, C. P. 2000. Advances in the Genetic Engineering of *Agaricus bisporus*. 42nd Penn State Mushroom Short Course. The Pennsylvania State University. University Park, PA
52. Romaine, C. P. 2000. Is *Trichoderma* Growing Tolerant of Benomyl? 42nd Penn State Mushroom Short Course. The Pennsylvania State University. University Park, PA
53. Invited speaker-Romaine, C. P. 2000. Viruses and Viral diseases on *Agaricus bisporus*." 2<sup>nd</sup> Mexican Mushroom Conference and FungiExpo 2000. Guadalajara, Mexico.
54. Invited speaker-Romaine, C. P. 2000. Molecular Biology and Genetics of the *Trichoderma* Green Mold Epidemic on Cultivated *Agaricus bisporus* in North America. 2<sup>nd</sup> Mexican Mushroom Conference and FungiExpo 2000. Guadalajara, Mexico.
55. Romaine, C. P. 2000. An Integrated Control Program for Green Mold Disease on the Cultivated Button Mushroom. Pennsylvania Department of Agriculture, Harrisburg, PA.
56. Romaine, C. P., X. Chen, M. Stone, M. D. Ospina-Giraldo, D. J. Royse. 2000. Development of Resistance to Benomyl in *Trichoderma harzianum* biotype 4 on Cultivated *Agaricus bisporus* Threatens the North American Mushroom Industry. XV<sup>th</sup> International Congress on the Science and Cultivation of Edible Fungi. Maastricht, The Netherlands.
57. Invited Speaker-Romaine, C. P., X. Chen, M. D. Ospina-Giraldo, and D. J. Royse. 2000. Molecular Genetics and Pathogenicity of Biocontrol and Mushroom *Trichoderma*. 6<sup>th</sup> IOBC/WPRS-EFPP Biocontrol Workshop. Sevilla, Spain.
58. Royse, D. J., M. D. Ospina-Giraldo, X. Chen, and C. P. Romaine. 2000. Phylogenetic Analysis of *Trichoderma* spp. Associated with Mushroom Culture or Used for Biological Control of Plant Pathogens. 6<sup>th</sup> IOBC/WPRS-EFPP Biocontrol Workshop. Sevilla, Spain.
59. Viji, G., C. P. Romaine, and W. Uddin. 2000. "Efficacy and Timing of Application of *Pseudomonas aeruginosa* for Controlling Ryegrass Blast." Annual Meeting of the American Phytopathological Society. New Orleans, LA.
60. Viji, G., W. Uddin, C. P. Romaine, and F. E. Moorman. 2000. "Evaluation of Antagonists from Spent Mushroom Substrate for Suppression of Turfgrass Diseases." Annual Meeting of the American Phytopathological Society. New Orleans, LA.

61. Invited speaker-Romaine, C. P. 1999. "Molecular Biology and Genetics of Viral and Fungal Diseases of Cultivated *Agaricus bisporus*." El Colegio De La Frontera Sur. Tapachula, Mexico.
62. Invited speaker-Romaine, C. P. 1999. Round Table Discussion-"Patch Disease on *Agaricus bisporus*." Horticultural Research Institute. Wellsbourne, England.
63. Romaine, C. P. 1999. "Phylogenetic Analysis of *Trichoderma* spp. Associated with Green Mold on *Agaricus bisporus* using a Sequence in Beta-tubulin Gene 1." 3<sup>rd</sup> International Conference on Mushroom Biology and Mushroom Products. Sydney, Australia.
64. Romaine, C. P. 1999. "Trichoderma Green Mold on *Agaricus bisporus*." 41<sup>st</sup> Penn State Mushroom Short Course. University Park, PA.
65. Romaine, C. P. 1999. "Green Mold Disease of the Cultivated Mushroom." Department of Agriculture. Harrisburg, PA.
66. Romaine, C. P. 1999. "Effects of SMS on Plant Growth." MIFBAR Grant Program Advisory Board American Mushroom Institute. Avondale PA.
67. Chen, X. and C. P. Romaine. 1999. "Characterization of a Benlate-resistant Mutant of *Agaricus bisporus*." 41<sup>st</sup> Penn State Mushroom Short Course. University Park, PA.
68. Royse, D. J., M. D. Ospina-Giraldo, X. Chen, and C. P. Romaine. 1998. "Phylogenetic Relationships Among Mushroom Green Mold-associated and Biocontrol Isolates of *Trichoderma harzianum*". 7th International Congress of Plant Pathology. Edinburgh, Scotland.
69. Invited speaker-Romaine, C. P. 1998. "Unraveling the Viral Complex in *Agaricus bisporus*". 7th International Congress of Plant Pathology. (1998) Edinburgh, Scotland.
70. Ospina-Giraldo, M. D., D. J. Royse, X. Chen, and C. P. Romaine. (1998). "Phylogenetic Relationships of Biocontrol and Green Mold-associated Strains of *Trichoderma*." 40th Penn State Mushroom Industry Short Course. University Park, PA.
71. Romaine, C. P. (1998). "Spent Mushroom Compost." Mushroom Advisory Meeting. Kennett Square, PA.

72. Royse, D. J., Romaine, C. P., P. J. Wuest, and D. M. Beyer. (1998). "Trichoderma Green Mold: Research Update." 40th Penn State Mushroom Industry Short Course. University Park, PA.
73. Wuest, P. J., C. P. Romaine, D. J. Royse, and D. M. Beyer. (1998). Research Projects Update-Compost Odors, *Trichoderma*, and Spent Compost Usage." 13th North American Mushroom Conference. San Francisco, CA.
74. Chen, X., C. P. Romaine, M. D. Ospina-Giraldo, and D. J. Royse. "An Evaluation of Genotypes of *Agaricus bisporus* for Resistance to Trichoderma Green Mold". 40<sup>th</sup> Penn State Mushroom Short Course. University Park, PA.
75. Romaine, C. P., X. Chen, M. D. Ospina-Giraldo, and D. J. Royse. 1998. "Genetic Analysis of the Trichoderma Green Mold Epidemic in *Agaricus bisporus*." Mycological Society of America. San Juan, Puerto Rico.
76. Chen, X., Q. Tan, B. Schlagnhauer, M. D. Ospina-Giraldo, D. J. Royse, and C. P. Romaine. 1998. "A Genetic Analysis of the Interaction Between *Trichoderma* spp. and *Agaricus bisporus*." Mid-Atlantic States Mycology Conference. Blacksburg, VA.
77. Chen, X., M. D. Ospina-Giraldo, D. J. Royse, and C. P. Romaine. 1998. "Phylogenetic Analysis of *Trichoderma* spp. Associated with Green Mold in Mushrooms." Annual Meeting of The American Phytopathological Society. Las Vegas, NV.
78. Ospina-Giraldo, M. D., X. Chen, D. J. Royse, and C. P. Romaine. 1998. "Biological Control Strains of *Trichoderma harzianum*: Not the Most Recent Ancestors of Th2 and Th4 Biotypes Causing Mushroom Green Mold." Annual Meeting of The American Phytopathological Society. Las Vegas, NV.
79. Sulzinski, M. A., K. M. Teufel, and C. P. Romaine. 1998. "Early Multiplication and Distribution of *Xanthomonas campestris* pv. *pelargonii* in Inoculated Geraniums." Annual Meeting of The American Phytopathological Society. Las Vegas, NV.
80. Romaine, C. P. 1998. "Molecular Dissection of the Viral Complex in *Agaricus bisporus*." Mid-Atlantic States Mycology Conference. Blacksburg, VA.
81. Invited speaker-Romaine, C. P. 1997. "Molecular Dissection of the Viral Complex Associated with *Agaricus bisporus*." The Chinese University of Hong Kong. China.

82. Invited speaker-Romaine, C. P. 1997. "Molecular Biology of La France Disease and Green Mold Disease in *Agaricus bisporus*." Edible Fungi Institute, Shanghai Academy of Agricultural Sciences. Shanghai, China.
83. Invited speaker-Romaine, C. P. 1997. "Genetic Analysis of the Interaction Between *Trichoderma harzianum* and *Agaricus bisporus*." Beijing Agricultural University, Beijing, China.
84. Weir, T., Romaine, C. P., and B. J. Christ. 1997. "The Use of RADP Markers to Determine Genetic Variability in *Alternaria solani*, the Causal Agent of Early Blight on Potato and Tomato, and *Alternaria alternata*." College of Agricultural Sciences Annual Graduate Research Exhibition. University Park, PA.
85. Weir, T., Romaine, C. P., and B. J. Christ. 1997. "The Use of RADP Markers to Determine Genetic Variability in *Alternaria solani*, the Causal Agent of Early Blight on Potato and Tomato, and *Alternaria alternata*." Penn State Twelfth Annual Graduate Research Exhibition. University Park, PA.
86. Sulzinski, M. A., B. Schlagnhauser, G. W. Moorman, and C. P. Romaine. 1997. "PCR-based Detection of Occult Infections by *Xanthomonas campestris* pv. *pelargonii* in Geranium." Annual Meeting of The American Phytopathological Society. Rochester, NY.
87. Sulzinski, M. A., C. P. Romaine, K. Kelly, and M. Tiffany. 1997. "PCR-based Assay to detect *Xanthomonas campestris* pv. *pelargonii*." Workshop- Rapid Diagnostic Assays for Plant Pathogens. Annual Meeting of The American Phytopathological Society. Rochester, NY.
88. Ruffin, H. M., P. G. Hatcher, and C. P. Romaine. 1997. "Differential Utilization of a Novel Growth Supplement in Axenic Cultures of *Trichoderma harzianum* and *Agaricus bisporus*." Penn State CURO Research Program. University Park, PA.
89. Romaine, C. P. 1997. "Virus-A Portabella Problem." Penn State Mushroom Review. University Park, PA.
90. Romaine, C. P. 1997. "Trichoderma Green Mold: Current Research and Control." Penn State Mushroom Short Course. University Park, PA.
91. Romaine, C. P. 1997. "Green Mold Update." Chester Co. Mushroom Growers Meeting. Kennett Square, PA.
92. Ospina-Giraldo, M. D., C. Watson, R. Gueldner, X. Chen, C. P. Romaine, and D. J. Royse. 1997. "In Vitro Evaluation of Biological Fungicides for

Control of *Trichoderma* Green Mold of the Button Mushroom.” Annual Meeting of the American Phytopathological Society. Rochester, NY.

93. Ospina-Giraldo, M. D., M. Thon, X. Chen, C. P. Romaine, and D. J. Royse. 1997. “Phylogeny of *Trichoderma* spp. Associated with Mushroom Green Mold in Europe and North America.” Annual Meeting of the American Phytopathological Society. Rochester, NY.
94. Ospina-Giraldo, M. D., D. J. Royse, M. R. Thon, X. Chen, and C. P. Romaine. 1997. “Genetic Analysis of *Trichoderma* spp. Associated with Green Mold in North America and Europe”. Penn State Mushroom Short Course. University Park, PA.
95. Chen, X., Q. Tan, B. Schlagnhauer, M. D. Ospina-Giraldo, D. J. Royse, and C. P. Romaine. 1997. “A Genetic Analysis of the Interaction between *Trichoderma* and *Agaricus bisporus*”. Penn State Mushroom Short Course. University Park, PA.
96. Chen, X., M. Ospina-Giraldo, Q. Tan, B. Schlagnhauer, D. J. Royse, and C. P. Romaine. 1997. “Molecular Genetic Analysis of *Trichoderma* Associated with Mushroom Green Mold in Pennsylvania.” Annual Meeting of the American Phytopathological Society. Rochester, NY.
97. Chen, X., M. Ospina-Giraldo, B. Schlagnhauer, D. R. Huff, D. J. Royse, and C. P. Romaine. 1997. “DNA Fingerprint Analysis for the Identification of the *Trichoderma* Fungus Inciting the Mushroom Green Mold Epidemic in Pennsylvania.” College of Agricultural Sciences Annual Graduate Research Exhibition. University Park, PA.
98. Chen, X., M. Ospina-Giraldo, B. Schlagnhauer, D. R. Huff, D. J. Royse, and C. P. Romaine. 1997. “DNA Fingerprint Analysis for the Identification of the *Trichoderma* Fungus Inciting the Mushroom Green Mold Epidemic in Pennsylvania.” Penn State Twelfth Annual Graduate Research Exhibition. University Park, PA.
99. Ospina-Giraldo, M. D., D. J. Royse, M. R. Thon, X. Chen, and C. P. Romaine. 1996. “Phylogenetic Relationships of *Trichoderma harzianum* Causing Mushroom Green Mold in Europe and North America to Other Species of *Trichoderma* from World-wide Sources.” International Mushroom Green Mold Round Table. Glenn Mills, PA.
100. Chen, X., M. D. Ospina-Giraldo, Q. Tan, B. Schlagnhauer, D. R. Huff, D. J. Royse, and C. P. Romaine. 1996. “Genetic Analysis of *Trichoderma* Associated with Mushroom Green Mold in Pennsylvania.” International Mushroom Green Mold Round Table. Glenn Mills, PA.

101. Sulzinski, M. A., G. W. Moorman, B. Schlagnhauser, and C. P. Romaine. 1996. "Characteristics of a PCR-based Assay for *Xanthomonas campestris* pv. *pelargonii*." Northeastern Division Meeting of The American Phytopathological Society. Long Branch, NJ.
102. Qi, T., M. Ospina-Giraldo, C. P. Romaine, B. Schlagnhauser, C. Xi, D. R. Huff, and D. J. Royse. 1996. "Genetic Analysis of the *Trichoderma* spp. Associated with the Green Mold Epidemic in the Button Mushroom. Annual Meeting of The American Phytopathological Society. Indianapolis, IN.
103. Ospina-Giraldo, M. D., D. J. Royse, C. Xi, and C. P. Romaine. 1996. "*In Vitro* Inhibition of *Trichoderma harzianum*, Cause of Mushroom Green Mold, by *Paenibacillus macerans* Isolated from Compost." Annual Meeting of The American Phytopathological Society. Indianapolis, IN.
104. Romaine, C. P. and B. Schlagnhauser. 1996. "PCR Analysis of Three RNA Genetic Elements in *Agaricus bisporus*." Second International Conference on Mushroom Biology and Mushroom Products. University Park, PA.
105. Romaine, C. P. 1996. "PCR-based Detection of *Trichoderma harzianum* Type 4 Associated with Mushroom Green Mold." Berks Co. Mushroom Growers Meeting. Temple, PA.
106. Romaine, C. P. 1996. "Genetics, Identification, and Origin of the *Trichoderma harzianum* Associated with the Green Mold Epidemic in Mushrooms." Environmental Quality Symposium '96 for Mushroom Growers. Stroud Water Research Center. Avondale, PA.
107. Romaine, C. P. 1996. "Diagnostic PCR." Penn State Biotechnology and Bioprocessing Short Course. University Park, PA.
108. Romaine, C. P. 1995. "Trichoderma Green Mold in Pennsylvania." Chester Co. Mushroom Growers Meeting. Kennett Square, PA.
109. Romaine, C. P. 1995. "Recent Research on Trichoderma Green Mold." Berks Co. Mushroom Growers Meeting. Temple, PA.
110. Romaine, C. P. 1995. "Mushroom Green Mold: Cause, Edaphic Factors, and Control." Pennsylvania Department of Agriculture. Harrisburg, PA.
111. Romaine, C. P. 1995. "An Overview of Mushroom Research." Mushroom Industry Advisory Committee. University Park, PA.
112. Higgins, B., C. P. Romaine, and J. E. Ayers. 1995. "Usefulness of RAPD-PCR in Providing Markers for Investigations into the Genetics of the Ht1



Gene and *Exserohilum turcicum*." Fiftieth Northeast Corn Improvement Conference. Lancaster, PA.

113. Goodin, M. M. and C. P. Romaine. 1995. "Molecular Characterization of Two *Agaricus* Viruses." Penn State Mushroom Short Course. University Park, PA.
114. Sulzinski, M. A., B. Schlagnhauer, G. W. Moorman, and C. P. Romaine. 1994. "Detection of *Xanthomonas campestris* pv. *pelargonii* by Hybridization-specific PCR." Annual Meeting of the American Phytopathological Society. Ithaca, NY.
115. Romaine, C. P., and B. Schlagnhauer. 1994. "Evidence for the Independent Replication of the Viruses Associated with La France Disease of *Agaricus bisporus*." Northeastern and Potomac Division Meeting of the American Phytopathological Society. Carlisle, PA.
116. Invited speaker-Romaine, C. P., and A. Marlowe. 1994. "Oilseed Supplements - Properties of a Natural Time-released Nutrient Supplement." North American Mushroom Conference. Marco Island, FL.
117. Romaine, C. P., and S. Fleischer. 1994. "Pest Management". Penn State Mushroom Short Course". University Park, PA.
118. Invited speaker-Romaine, C. P. 1994. "Molecular Biology of La France Disease". Sylvan Symposium. Lake Tahoe, NV.
119. Invited speaker-Romaine, C. P. 1994. "Biological Significance of Extrinsic RNA Genetic Elements in *Agaricus bisporus*". International Mycological Society Conference, Vancouver, Canada.
120. Romaine, C. P. 1994. "Foreign RNA Genetic Elements in *Agaricus bisporus*. Penn State Mushroom Short Course". University Park, PA.
121. Romaine, C.P. 1994. "Overview of Mushroom Research." Mushroom Industry Advisory Committee. University Park, PA.
122. Goodin, M. M., B. Schlagnhauer, and C. P. Romaine. 1994. "Properties of the Virion-associated RNA Polymerase Activity of La France Isometric Virus." Northeastern and Potomac Division Meeting of the American Phytopathological Society. Carlisle, PA.
123. Romaine, C. P., B. Schlagnhauer, and M. M. Goodin. 1993. "Molecular Characterization of the Viral Complex Associated with La France Disease." Annual Potomac Division Meeting of the American Phytopathological Society. St. Michaels, MD.

124. Romaine, C. P., B. Schlagnhaufer, and M. M. Goodin. 1993. "Double-stranded RNA Genetic Elements in *Agaricus bisporus*." Penn State Mushroom Short Course. University Park, PA.
125. Romaine, C. P. 1993. "Progress in Mushroom Virus Research." Mushroom Industry Advisory Committee. University Park, PA.
126. Goodin, M. M., B. Schlagnhaufer, and C. P. Romaine. 1993. "Molecular Cloning of La France Isometric Virus." Penn State Mushroom Short Course. University Park, PA.
127. Romaine, C. P., B. Schlagnhaufer, and M. M. Goodin. 1992. "Towards Genetically-engineered Virus Resistance in the Cultivated Mushroom: Molecular Analysis of the Viral Complex Associated with La France Disease." UM/USDA/Monsanto International Symposium on Biotechnology and Plant Protection, Viral Pathogenesis and Diseases Resistance. University of Maryland, College Park, MD.
128. Invited speaker-Romaine, C. P., B. Schlagnhaufer, and M. M. Goodin. 1992. "Molecular Biology of La France Disease of *Agaricus bisporus*." International Conference on the Genetics and Cellular Biology of Basidiomycetes II. University of Toronto, Mississauga, Canada.
129. Romaine, C. P. 1992. "Workshop on *Agaricus* Genetics." International Conference on the Genetics and Cellular Biology of Basidiomycetes II. University of Toronto, Mississauga, Canada.
130. Invited speaker-Romaine, C. P. 1992. "Molecular Analysis of the Viruses Implicated in La France Disease." NEC-79 Plant Transformation Meeting. Rutgers University, New Brunswick, NJ.
131. Romaine, C. P. 1992. "Weed Molds and Diseases." Penn State Mushroom Workshop-The Fundamentals. University Park, PA.
132. Keynote address-Romaine, C. P. 1992. "La France Disease: "A Case for a Viral Disease of the Commercial Mushroom *Agaricus bisporus*." Howard Hughes Seminar Series." Department of Biology, University of Scranton. Scranton, PA.
133. Romaine, C. P. 1992. "Molecular Biology of La France Disease of *Agaricus bisporus*." Penn State Mushroom Short Course. University Park, PA.
134. Romaine, C. P. 1992. "A Look at La France Viruses and Spawn Viruses." Penn State Mushroom Short Course. University Park, PA.

135. Romaine, C. P. 1991. "Characteristics of a Synthetic CACing Agent." Chester Co. Mushroom Growers Meeting. Kennett Square, PA.
136. Romaine, C. P. 1991. "Biology and Control of La France Disease." Penn State Mushroom Short Course. University Park, PA.
137. Romaine, C. P. 1991. "The Mushroom Virus Program at Penn State". Mushroom Industry Advisory Committee. University Park, PA.
138. Romaine, C. P. 1991. "Properties of a Synthetic CACing Agent." Mushroom Central Co. Kennett Square, PA.
139. Romaine, C. P. 1991. "Future Mushroom Research at Penn State." Mushroom Industry Research Program Planning Committee. Kennett Square, PA.
140. Romaine, C. P. 1991. "Future Mushroom Research at Penn State." Mushroom Industry Research Program Planning Committee. Reading, PA.
141. Romaine, C. P. 1991. "Development and Evaluation of Virus-Indexed Mushroom Strains." Pennsylvania Department of Agriculture. Harrisburg, PA.
142. Goodin, M. M., B. Schlagnhaufer, and C. P. Romaine. 1991. "The La France Disease-specific Double-stranded RNAs are Associated with 36 nm Isometric Particles and Disease-specific Polypeptides." Annual Meeting of the American Phytopathological Society. St. Louis, MO.
143. Goodin, M. M., B. Schlagnhaufer, and C. P. Romaine. 1991. "The La France Disease-specific Double-stranded RNAs are Encapsidated in Virus-like Particles." Annual Potomac Division Meeting of the American Phytopathological Society. University of Maryland, College Park, MD.
144. Romaine, C. P., B. Schlagnhaufer, and M. M. Goodin. 1990. "Lack of Sequence Homology Between the Genomic RNA of the Bacilliform Virus in *Agaricus bisporus* and the La France Disease-related Double-stranded RNAs." Annual Meeting of the American Phytopathological Society. Ann Arbor, MI.
145. Romaine, C. P. and B. Schlagnhaufer. 1990. "A Texturized Alginate-based Carrier for Filamentous Fungi: Use in the Cultivation of *Agaricus bisporus*". Annual Meeting of the Mycological Society of America. Madison, WI.
146. Romaine, C. P. 1990. "A Holistic Approach to Controlling Viruses in *Agaricus bisporus*." Amycel Co. Berks Co. Mushroom Growers Meeting. Reading, PA.

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